IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re patent application of

Bertram SUGG — Before the Board of Appeals

Serial No. 10/540,026 — Art Unit: 2837

Filed: January 25, 2006 — Examiner: B. Gordon

For: PIEZOELECTRIC ACTUATOR AND A METHOD FOR ITS MANUFACTURE

APPELLANT'S BRIEF (37 CFR 41.37)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Date: October 19, 2009

Sir:

This Brief is filed in support of the Notice of Appeal filed on August 18, 2009, appealing the Examiner's decision of making final a rejection of claims 9, 10, 13, 14 and 29-32.

The $540 fee for this Appeal Brief and any other required fee should be charged to Deposit Account No. 07-2100 by the attached deposit account form.

I - REAL PARTY IN INTEREST

The real party in interest in this appeal is:

Robert Bosch GmbH

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II - RELATED APPEALS AND INTERFERENCES

With respect to other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal, there are no such appeals or interferences. None

III - STATUS OF CLAIMS

A. TOTAL NUMBER OF CLAIMS IN APPLICATION - Eight (8).

Claims in the application are: 9, 10, 13, 14 and 29-32.

B. STATUS OF ALL THE CLAIMS

1. Claims canceled: 1-8, 11, 12 and 15-28.
2. Claims withdrawn from consideration but not canceled: None.
3. Claims pending: 9, 10, 13, 14 and 29-32.
4. Claims allowed: None.
5. Claims rejected: 9, 10, 13, 14 and 29-32.

C. CLAIMS ON APPEAL

The claims on appeal are: 9, 10, 13, 14 and 29-32.

IV - STATUS OF AMENDMENTS

A reply to the final rejection was filed on July 23, 2009, containing appellant's arguments, but no amendments to the claims were made. An Advisory Action was mailed on July 30, 2009, indicating that the reply would not be entered for purposes of appeal. Thus, the claims on appeal are identical to the claims that were finally rejected.

V - SUMMARY OF CLAIMED SUBJECT MATTER

In the following summary, all references to pages and lines can be found in the original English-language specification filed on June 22, 2005. However, it should be noted that the original English-language specification contained a number of minor errors that were corrected by the preliminary amendment also filed on June 22, 2005. The references to pages and lines in the following summary are intended as examples of where the claim language may be found in the specification and are not intended to be exclusive.

Independent claim 9 is directed to a piezoelectric actuator, comprising

a multi-layered construction of piezoelectric layers (2) interleaved with inner electrodes (3, 4; 14, 15) (p. 3, ll. 6-8) and

an alternating contacting of the inner electrodes (3, 4; 14, 15) with outer electrodes (5, 6; 11) (p. 3, ll. 8-10), the regions between the outer electrodes (5, 6; 11) being provided with an insulation layer (12, 13), comprised of the same ceramic material as the piezoelectric layers (2), and thus having the same properties as the piezoelectric layers (2) themselves (p. 4, ll. 11-19), and the insulating layer (12, 13) being applied to the outer surface of the piezoelectric actuator (1; 10) in the green state of the piezoelectric actuator (1, 10), before sintering (p. 3, l. 17 through p. 4, l. 3).

Independent claim 29 is directed to an apparatus made by the following steps,

providing a piezoelectric stack having alternating layers of piezoelectric material and inner electrodes (p. 3, ll. 8-10), and

prior to any sintering of the stack, coating the outside of the piezoelectric stack with a

layer of material which is the same material as the piezoelectric layers (p. 3, l. 17 through p. 4, l. 3).

VI - GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 9, 10, 13, 14 and 29-32 stand rejected under 35 U.S.C. 102(b) as anticipated by Schreiner et al (PG Pub 20020175591).

VII - ARGUMENTS

The rejection of claims 9, 10, 13, 14 and 29-32 under 35 U.S.C. 102(b) as anticipated by Schreiner et al

Arguments applicable to claims 9, 10, 13, 14

Schreiner et al teaches a piezoelectric actuator comprising a multi-layered construction of piezoelectric layers (2) interleaved with inner electrodes (3). The actuator is provided with an insulating coating on the edges of the piezoelectric layers (2). The insulating coating on the edges of the piezoelectric layers (2) is a so-called "sinter skin." This "skin" of Schreiner et al is created as part of the sintering process, and it is formed from the material of the piezoelectric layers of the stack. The reference to Schreiner et al has no indication whatsoever that an additional insulating layer is applied to the stack while the piezoelectric stack is in its green state, before sintering, as is recited in claim 9.

In the absence of any disclosure of such a layer being added to the stack and that then the composite stack and its coating is sintered, the reference to Schreiner et al has structure which is very similar, but is different from the structure which is recited in the claims of this application. With no disclosure in Schreiner et al of such an insulation layer being added, the "skin" of Schreiner et al will be formed from the piezoelectric layers on the exposed edges/surfaces of the piezoelectric layers (2). And with this being the case, the insulation layer which results in Schreiner et al will have depressions where the inner electrodes are positioned, and the edges of inner electrodes will not be insulated. This is made absolutely clear upon a careful reading of the reference, wherein, at para. 23, Schreiner et al teaches that:

A multilayer actuator 16 that has been manufactured according

> to the process according to the invention is shown in a schematic, much enlarged representation in FIG. 3. It has a circular cross-section 12 and is fully coated by a sinter skin 17. The internal electrodes 11 of the same polarity are fully exposed on the peripheral face, whereas in the case of the internal electrodes of opposite polarity the circumference is broken because of the missing circular section. This design is advantageously utilised to connect the internal electrodes of the same polarity to the respective external electrode 18, at the opposite sides of the multilayer actuator where the internal electrodes of the same polarity can now be seen at the periphery. The sinter skin 17 is removed in this region by grinding, and the internal electrodes 11 are exposed at their peripheral face. A continuous recess 20, formed from the holes 15 lying one above the other in the green films 10, which can be used for fixing purposes, runs concentrically to the axis 19 of the multilayer actuator 16. (Emphasis added)

The examiner apparently reads Schreiner et al as teaching that the "sinter skin" forms over the outer edges of the internal electrodes, because Schreiner et al teaches that "[t]he insulating sinter skin needs only to be removed at the connecting faces where the internal electrodes have to be connected to the respective external electrode, for example by grinding" (para. 6) and "[t]he sinter skin 17 is removed in this region by grinding, and the internal electrodes 11 are exposed at their peripheral face" (para. 23).

However, when one considers Schreiner et al's teaching that the internal electrodes 11 of the same polarity are fully exposed on the peripheral face, it is clear that the insulating sinter skin to be removed by grinding is the sinter skin formed on the edges of the piezoelectric layers (2). The grinding step is necessary to provide an even or smooth surface on which the external electrode may then be applied, not to remove any sinter skin on the edges of the internal electrodes.

The peripheral surface of the stack of Schreiner et al will not have the smooth surface as will be the case for the structure recited in appellant's claims, since the peripheral surface of the stack of Schreiner et al will have small depressions located at the edges of the internal electrodes which are "fully exposed on the peripheral face."

There will be no insulation over the edges of the inner electrodes in Schreiner et al. This fact is further shown by Schreiner et al in Figure 3, wherein the internal electrodes 11 are shown to not have a coating of an insulation layer. Schreiner et al never, not anywhere in its disclosure, includes mention of insulation which will cover the edges of the internal electrodes.

As opposed to this, claim 9 and its dependent claims recite that an insulation layer is coated on the stack before/prior to sintering. While this is a limitation which is couched in terms of a process, it nevertheless is a limitation of the claims. And this limitation, even though couched in the form of a process step, results in structure which is not in any way disclosed by Schreiner et al. This process step of coating the stack with material which is recited to be comprised of the same material as the piezoelectric layers, and doing so before or prior to sintering, leads to an insulation layer, after sintering, which coats the entire outside of the stack and this includes the edges of the internal electrodes.

Schreiner et al lacks a teaching of an apparatus which has a piezoelectric stack, which also has a coating which consists of the same material as the piezoelectric layers themselves, with this structure being created prior to sintering the stack as recited in claims 9, 10, 13 and 14. Schreiner et al. may well sinter their stack and thus obtain a sintered skin on the outside of their piezoelectric layers, but this leaves the problem that the electrodes 11 of Schreiner et al

will never be covered, and never have an insulation layer at their edges. Schreiner et al does not teach adding any coating to the stack, it only teaches that the stack is sintered. This results in structure which is different from appellant's in that appellant's structure has a layer of sintered piezoelectric material covering the outer edges of the inner electrodes, whereas the structure of Schreiner et al does not have this covering on the outer edges of the inner electrodes.

Arguments applicable to claim 29

Independent claim 29 is a product-by-process claim. The resulting product defined by the method steps of claim 29 is a piezoelectric stack, which has not been sintered, having alternating layers of piezoelectric material and inner electrodes and a coating on the outside of the piezoelectric stack comprising a layer of material which is the same material as the piezoelectric layers.

Schreiner et al teaches a method or process for the manufacture of a piezoelectric multilayer actuator, in which thin layers made from a piezoceramic material, termed green films, onto which at least one internal electrode is placed, are stacked one above the other into a block, so that the internal electrodes are led out alternately at opposing faces of the actuator, where they are interconnected by an external electrode, the block is laminated, at least one actuator is separated from the block, the actuator is shaped by means of a machining operation and then sintered. As a result of the sintering step, a sinter skin is formed, which is abraded at the points where the internal electrodes are connected to the external electrodes. See, claim 1.

In the Final Rejection of claim 29, the examiner describes Schreiner et al as teaching

an apparatus made by the following steps, providing a piezoelectric stack having alternating layers of piezoelectric material and inner electrodes (3). The examiner does not find a teaching of applying a coating on the outside of the piezoelectric stack comprising a layer of material which is the same material as the piezoelectric layers, but gives this language in claim 29 no patentable weight. This is a fundamental error of claim construction.

The product defined by claim 29 is not simply a piezoelectric stack having alternating layers of piezoelectric material and inner electrodes, as suggested by the examiner. Claim 29, in fact, defines an apparatus including a piezoelectric stack, which has not been sintered, having alternating layers of piezoelectric material and inner electrodes and a coating on the outside of the piezoelectric stack comprising a layer of material which is the same material as the piezoelectric layers.

To support a rejection of a claim under 35 U.S.C. 102(b), it must be shown that each element of the claim is found, either expressly described or under principles of inherency, in a single prior art reference. See Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 772, 218 USPQ 781, 789 (Fed. Cir. 1983), cert. denied, 465 U.S. 1026 (1984).

Schreiner et al does not teach an apparatus including a piezoelectric stack, which has not been sintered, having alternating layers of piezoelectric material and inner electrodes and a coating on the outside of the piezoelectric stack comprising a layer of material which is the same material as the piezoelectric layers. Therefore, Schreiner et al does not anticipate claim 29.

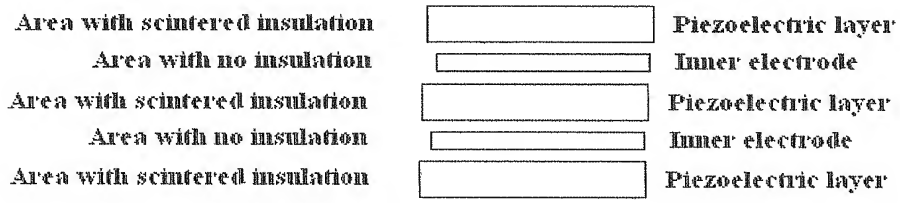
Arguments applicable to claim 30-32

Claim 30 depends on claim 29 and further recites that "after the piezoelectric stack is

coated with the same material as is used as the piezoelectric material, sintering the apparatus so that the material used as the coating becomes hard, smooth and impervious, and forms an insulation layer for the piezoelectric stack."

Schreiner et al teaches that a "skin" 17 is formed on the stack as a result of the sintering step. While Schreiner et al teaches a "sinter skin" 17, there is no specific teaching that this "sinter skin" covers the end or edges of the inner electrodes. Thus, Schreiner et al's sintered stack will have a rough or uneven outer periphery. The coating of Schreiner et al will not be smooth as recited in claim 30.

The structure of Schreiner et al does not provide an insulation layer which covers the edges of the inner electrodes, whereas the product as recited in claim 30 does have an insulation layer which covers the inner electrodes. As shown in the greatly enlarged sketch below, the areas adjacent the inner electrodes of Schreiner et al will not have insulation present, because only the piezoelectric layers receive a sintered skin.



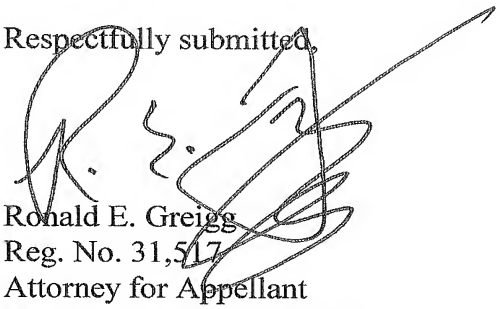
The situation is different with appellant's structure. Since, as recited in claim 30, the entire piezoelectric stack is coated with piezoelectric material and then this coating is sintered, even the areas immediately outside the inner electrodes will have an insulation layer of sintered piezoelectric material. Thus, appellant's structure as claimed in claims 30-32 is

different from the structure of Schreiner et al.

Conclusion

For the reasons stated above, the appellants request that the Examiner's rejections of the claims be reversed.

Respectfully submitted,



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VIII - CLAIMS APPENDIX

Claims 1-8. **(Canceled)**

9. **(Rejected)** A piezoelectric actuator, comprising

a multi-layered construction of piezoelectric layers (2) interleaved with inner electrodes (3, 4; 14, 15), and

an alternating contacting of the inner electrodes (3, 4; 14, 15) with outer electrodes (5, 6; 11), the regions between the outer electrodes (5, 6; 11) being provided with an insulation layer (12, 13), comprised of the same ceramic material as the piezoelectric layers (2), and thus having the same properties as the piezoelectric layers (2) themselves, and the insulating layer (12, 13) being applied to the outer surface of the piezoelectric actuator (1; 10) in the green state of the piezoelectric actuator (1, 10), before sintering.

10. **(Rejected)** The piezoelectric actuator according to claim 9, wherein the insulating layer (12, 13) encloses the edges of the piezoelectric actuator (1; 10).

Claims 11-12. **(Canceled)**

13. **(Rejected)** The piezoelectric actuator according to claim 9, wherein the outer electrodes (5, 6; 11) are attached to regions of the insulating material that have been uncovered by grinding.

14. **(Rejected)** The piezoelectric actuator according to claim 10, wherein the outer electrodes (5, 6; 11) are attached to regions of the insulating material that have been uncovered by grinding.

Claims 15-28. **(Canceled)**

29. **(Rejected)** An apparatus made by the following steps,

providing a piezoelectric stack having alternating layers of piezoelectric material and inner electrodes, and

prior to any sintering of the stack, coating the outside of the piezoelectric stack with a layer of material which is the same material as the piezoelectric layers.

30. **(Rejected)** An apparatus as recited in claim 29, wherein the steps also include,

after the piezoelectric stack is coated with the same material as is used as the piezoelectric material, sintering the apparatus so that the material used as the coating becomes hard, smooth and impervious, and forms an insulation layer for the piezoelectric stack.

31. **(Rejected)** An apparatus as recited in claim 30, wherein the steps also include,

after the piezoelectric stack is sintered and the coating layer is hardened, removing portions of the sintered coating.

32. **(Rejected)** An apparatus as recited in claim 31, wherein the steps also include,

after portions of the sintered coating have been removed, adding outer electrodes to the area which has had the coating removed in a manner such that the outer electrodes make appropriate contact with the inner electrodes.

IX - EVIDENCE APPENDIX

None

X - RELATED PROCEEDINGS APPENDIX

None